

FINAL REPORT

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APPLICATIONS OF THE MÖSSBAUER EFFECT TO THE STUDY OF SOLIDS

by

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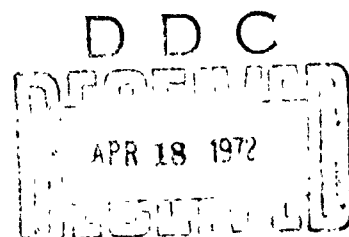
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<p>This report deals with the research accomplished under sponsorship of the Air Force Office of Scientific Research Grant Number AFOSR-69-1634. The principal areas of research were in the investigation of magnetic ordering in diluted magnetic materials and an investigation of heat transport in superconductors by the forced motion of normal regions induced by an external magnetic field.</p>			

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ABSTRACT

This report deals with the research accomplished under sponsorship of the Air Force Office of Scientific Research Grant Number AF646-64. The principal areas of research were in the investigation of magnetic ordering in diluted magnetic materials and an investigation of heat transport in superconductors by the forced motion of normal regions induced by an external magnetic field.

TECHNICAL

In the course of the development of the research funded under this grant, attention became concentrated in two areas.

1. Mössbauer studies of the magnetic or exchange interactions among magnetic impurities in non-magnetic hosts and;
2. The transport of heat in superconductors induced by the motion of non superconducting regions created by an applied magnetic field.

Development in both of these areas was satisfactory. A method of measuring magnetic interactions was successfully worked out and applied to the Iron-Palladium system. The complete method is described in publication number six. The technique thus described has been adopted by a number of investigators in other laboratories to the study of other magnetic systems. The phenomenon of heat transport in superconductors by the motion of normal regions has been fully understood and investigated in Type I superconductors. These results appear in publications number four and five and in the Master's degree thesis of Michiko Yoshihara. Heat transport by a similar technique in Type II superconductors occurs by quite a different mechanism from that of Type I and was observed in our laboratory, however, this phenomenon has not yet been fully investigated. The ideas investigated here hold some promise of being useful in the development of a new method of producing low temperatures.

In addition, this grant has supported in part the work of Dr. Bernard Bertman* on ballistic heat pulses in solid helium. The principal results of this work are contained in publication number seven.

*deceased

PUBLICATIONS

1. JOURNAL
The Range of Ferromagnetic Exchange Interaction in Nonmagnetic Films on Iron Substrates J. Appl. Phys. 36, 968-970
1965
2. PROCEEDINGS
Proceedings of the 10th International Conference on Low Temperature Physics, Temperature Dependence of the Magnetization of the Alloy Fe 13.2-Pd 86.8 Near the Curie Temperature
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8. THESIS
Wesleyan University, Physics Department
Richard A. Lindren, M. S. Degree
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Wesleyan University, Physics Department
Ekaterini Siafaca, M. S. Degree
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Michiko Yoshihara, M. S. Degree
Entropy Transport in Type-I and Type-II Superconductors
Associated with the Motion of Flux-Containing Normal Regions, 1970
11. THESIS
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John Smith, M. S. Degree
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Dilute Iron Alloys, 1970
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Philip Russell, B. S. Degree
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In a Cubic, Nonmagnetic Lattice, 1965
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Michael L. Burack, B. S. Degree
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1964
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Wesleyan University, Physics Department
Michael D. Rosenthal, B. S. Degree
The Influence of a Current Density on the Effective Temperature
of Impurity Atoms Bound in a Metallic Lattice, 1965

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